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# INFANT MORTALITY PATTERNS IN OSTEOARCHEOLOGICAL SAMPLES

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## Abstract

Infant mortality patterns were investigated in 20 osteoarcheological samples from the territory of present-day Hungary and dated to the 3rd-17th centuries. All series contained a lower number of 0-year-olds and a surplus of 5-14-year-olds as compared with the model life tables of COALE and DEMÉNY. Even if the number of 0-year-olds was corrected, the death rate of the 1-4-year age group, and especially that of the 5-14-year age group, did not show the infant mortality rate to be expected from the model life tables. This brings into question either the adoptability of model life tables in paleodemographic studies or the demographic validity of the skeletal material as a mirror of the one-time living community.

*Key words*: infant mortality, paleodemography, model life table, Hungary, 3rd-17th centuries

## Introduction

An undisturbed cemetery used between the middle of the 9th century and the beginning of the 10th century at the Esztergályhorváti-Alsóbárándpuszta site (Western Hungary) was completely uncovered by R. MÜLLER in 1981 (SZŐKE, 1996). Between 1994 and 1996, a complex paleoanthropological analysis was carried out by the authors, including non-metric traits by M. FINNEGAN. The skeletal material of 319 individuals is housed in the Balatoni Museum, Keszthely.

The present paper analyses the age group distribution of the infant skeletons from Esztergályhorváti-Alsóbárándpuszta and of 19 published samples, in comparison with the model life tables of COALE and DEMÉNY (1966).

## Results and discussion

Study of the infant mortality rates in 20 series (Table 1) in comparison with the model life tables of COALE and DEMÉNY (1966) (Table 2) revealed two noteworthy phenomena .

*Table 1* Infant mortality rates ($d_x$) at different sites (raw data)

| Sites and centuries | Cases | Age groups (years) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0 | 1-4 | 5-9 | 10-14 | 0-14 | 15-x |
| Late Roman Period, 3rd-5th | | | | | | | |
| Budapest-Kaszásdűlő (FRÁTER, 1993) | 335 | 10.15 | 5.34 | 8.54 | 14.69 | 38.72 | 61.28 |
| Keszthely-Dobogó (ACSÁDI and NEMESKÉRI, 1970) | 120 | 4.25 | 13.67 | 7.92 | 2.50 | 28.34 | 78.66 |
| Pécs-István tér (ÉRY, 1973) | 152 | 9.21 | 21.45 | 7.57 | 3.22 | 41.45 | 58.55 |
| Tokod (ÉRY, 1981) | 147 | 2.72 | 11.36 | 6.33 | 7.48 | 27.89 | 72.11 |
| Avar Period, 6th-8th | | | | | | | |
| Ártánd (ÉRY, 1966, 1967) | 258 | 2.33 | 7.79 | 9.03 | 6.82 | 25.97 | 74.03 |
| Bačko Petrovo Selo (ÉRY, 1990) | 100 | 3.00 | 17.00 | 12.00 | 5.00 | 37.00 | 63.00 |
| Gyenesdiás (T. RENDES, 1993) | 265 | 8.58 | 26.12 | 10.90 | 4.40 | 50.00 | 50.00 |
| Gyöngyöspata-Előmály (GARABÁS, 1993) | 209 | 4.30 | 13.78 | 11.29 | 4.50 | 33.87 | 66.13 |
| Kereki-Homokbánya (BERNERT, 1996) | 148 | 0.68 | 2.09 | 10.71 | 4.90 | 18.38 | 81.62 |
| Avar-Slavic Period, 9th | | | | | | | |
| Esztergályhorváti (under elaboration) | 319 | 18.18 | 24.33 | 10.66 | 2.95 | 56.12 | 43.88 |
| Garabonc I (ÉRY, 1992) | 82 | 8.54 | 20.85 | 4.02 | 3.17 | 36.58 | 63.42 |
| Sopronkőhida (ACSÁDI and NEMESKÉRI, 1970) | 145 | 14.66 | 17.88 | 11.40 | 2.28 | 46.22 | 53.78 |
| Zalaszabar-Dezsősziget (ÉRY, 1992) | 83 | 18.07 | 29.40 | 10.60 | 3.37 | 61.44 | 38.56 |
| Early Middle Age, 10th-11th | | | | | | | |
| Püspökladány I. (HÜSE et al., 1996) | 230 | 1.74 | 14.57 | 15.61 | 5.73 | 37.65 | 62.35 |
| Püspökladány II. (HÜSE et al., 1996) | 371 | 2.61 | 13.61 | 13.01 | 6.85 | 36.08 | 63.92 |
| Sárbogárd (ÉRY, 1967-68) | 100 | 3.00 | 8.00 | 15.70 | 7.30 | 34.00 | 66.00 |
| Late Middle Age, 13th-17th | | | | | | | |
| Alsórajk-Kastélydomb (MENDE, 1996) | 375 | 1.60 | 8.80 | 11.27 | 6.96 | 28.63 | 71.37 |
| Dombóvár-Békató (ÉRY, 1979-80) | 255 | 6.28 | 12.90 | 11,02 | 8.63 | 38.83 | 61.17 |
| Fonyód-Vár (NEMESKÉRI and NOZDROVICZKY, 1963) | 167 | 0.00 | 9.58 | 13.17 | 6.59 | 29.34 | 70.66 |
| Nagytálya (K. KOROMPAI, 1974) | 150 | 2.00 | 4.60 | 8.27 | 6.73 | 21.60 | 78.44 |
| Mean | | 6.10 | 14.16 | 10.45 | 5.54 | 36.40 | 63.60 |

*Table 2.* Infant mortality rates in model life tables of COALE and DEMÉNY

| Families and levels | $e_x^0$ | Age groups (years) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0 | 1-4 | 5-9 | 10-14 | 0-14 | 15-x |
| East 4 | 26.2 | 36.32 | 11.88 | 2.80 | 1.38 | 52.38 | 47.62 |
| West 4 | 26.4 | 30.08 | 13.66 | 3.00 | 2.14 | 48.88 | 51.12 |
| North 4 | 26.1 | 26.46 | 16.80 | 5.47 | 2.56 | 51.29 | 48.71 |
| South 4 | 27.3 | 25.74 | 19.97 | 3.46 | 1.67 | 50.84 | 49.16 |
| | Mean: | 29.65 | 15.58 | 3.68 | 1.94 | 50.85 | 49.15 |
| East 5 | 28.7 | 33.42 | 11.31 | 2.73 | 1.36 | 48.82 | 51.18 |
| West 5 | 28.8 | 27.56 | 12.85 | 2.90 | 2.07 | 45.38 | 54.62 |
| North 5 | 28.6 | 24.25 | 15.75 | 5.27 | 2.49 | 47.76 | 52.24 |
| South 5 | 29.7 | 23.97 | 18.60 | 3.32 | 1.62 | 47.51 | 52.49 |
| | Mean: | 27.30 | 14.63 | 3.56 | 1.88 | 47.37 | 52.63 |
| East 6 | 31.2 | 30.73 | 10.69 | 2.64 | 1.85 | 45.91 | 54.09 |
| West 6 | 31.3 | 25.25 | 12.02 | 2.78 | 2.57 | 42.62 | 54.38 |
| North 6 | 31.0 | 21.21 | 14.70 | 5.04 | 2.44 | 43.39 | 56.61 |
| South 6 | 32.1 | 22.35 | 17.27 | 3.15 | 2.17 | 44.94 | 55.06 |
| | Mean: | 21.89 | 13.67 | 3.40 | 2.26 | 44.22 | 55.78 |

The number of 0-year-old infants is less and the number of 5-14-year-old infants is higher than expected at levels 4, 5 and 6 on the basis of the model life tables.

This points clearly to the fact (often presumed) that a large number of infants were usually not buried in the community cemetery, or their graves were possibly destroyed due to erosion of the ground surface or other external forces during the centuries. The artificial loss of infants changed the life expectancy calculations not only at 0 years of age but in other age groups too. To eliminate this problem, correction of the number of infant deaths according to some mortality model has become a widely accepted practice. The model of COALE and DEMÉNY (1966) has been used in our work as usual, but we do not have any clear reference points as to what "family" and what level distribution should be used in the case of our paleoanthropological series (Table 2). Traditionally, level 5 is usually accepted, since, according to the ACSÁDI and NEMESKÉRI (1970) estimate, the average life expectancy at birth in the 10th-12th century population of Hungary was 28 to 29 years. What "family" (north, east, south or west in the COALE and DEMÉNY tables) mortality model should be used in our case (compared with the skeletal data) is completely unclear.

If we correct the number in 0-year-olds in the 20 series under investigation, for purely experimental purposes, and take the mean values of the 4 "families" (north, east, west and south) at level 5 as the basis of calculations, the age distribution of our samples is as shown in Table 3.

The percentages for the 1-4, 5-9 and 10-14-year age groups decrease relative to the original data due to the increase in the number of 0-year-olds, but even so they do not display the values to be expected on the basis of the model life tables. In the majority of

the cases, there is a lower rate in the 1-4-year age group and a higher rate in the 5-14-year age group.

This seems to indicate that the hiatus that can be observed for 0-year-olds in all of the samples under investigation is also partly true for the 1-4-year age group.

*Table 3.* Infant mortality rates ($d_x$) at different sites (corrected data).

| Sites and centuries | Age groups (years) | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 1-4 | 5-9 | 10-14 | 0-14 | 15-x |
| Late Roman Period, 3rd-5th | | | | | | |
| Budapest-Kaszásdűlő | 30.48 | 4.00 | 6.38 | 11.00 | 51.86 | 48.14 |
| Keszthely-Dobogó | 29.57 | 10.06 | 5.83 | 1.84 | 47.30 | 53.70 |
| Pécs-István tér | 32.35 | 15.98 | 5.64 | 2.40 | 56.37 | 43.63 |
| Tokod | 28.86 | 8.31 | 4.63 | 5.47 | 47.27 | 52.73 |
| Avar Period, 6th-8th | | | | | | |
| Ártánd | 28.61 | 5.69 | 6.60 | 4.99 | 45.89 | 54.11 |
| Bačko Petrovo Selo | 28.68 | 12.50 | 8.82 | 3.68 | 53.68 | 46.32 |
| Gyenesdiás | 31.94 | 19.44 | 8.11 | 3.28 | 62.77 | 37.23 |
| Gyöngyöspata-Előmály | 29.58 | 10.14 | 8.31 | 3.35 | 51.38 | 48.62 |
| Kereki-Homokbánya | 27.45 | 1.52 | 7.79 | 3.58 | 40.34 | 59.66 |
| Avar-Slavic Period, 9th | | | | | | |
| Esztergályhorváti | 27.09 | 21.68 | 9.50 | 2.63 | 60.90 | 39.10 |
| Garabonc I. | 31.82 | 15.55 | 3.00 | 2.36 | 52.73 | 47.27 |
| Sopronkőhida | 35.37 | 13.54 | 8.63 | 1.72 | 59.26 | 40.74 |
| Zalaszabar-Dezsősziget | 37.61 | 22.38 | 8.07 | 2.57 | 70.63 | 29.37 |
| Early Middle Age, 10th-11th | | | | | | |
| Püspökladány I. | 29.81 | 10.40 | 11.15 | 4.10 | 55.46 | 44.54 |
| Püspökladány II. | 28.74 | 9.97 | 9.53 | 5.01 | 53.25 | 46.75 |
| Sárbogárd | 28.68 | 5.88 | 11.54 | 5.37 | 51.47 | 48.53 |
| Late Middle Age, 13th-17th | | | | | | |
| Alsórajk-Kastélydomb | 28.21 | 6.42 | 8.17 | 5.08 | 47.88 | 52.12 |
| Dombóvár-Békató | 30.43 | 9.83 | 8.14 | 6.38 | 54.78 | 45.22 |
| Fonyód-Vár | 27.39 | 7.80 | 10.73 | 5.37 | 51.29 | 48.71 |
| Nagytálya | 28.29 | 3.37 | 6.05 | 4.93 | 42.64 | 57.36 |
| Mean | 30.05 | 10.72 | 7.83 | 4.26 | 52.86 | 47.14 |

However, at the same time, the higher mortality rate of 5-14-year-olds in almost all samples questions the validity of using various model life tables as a measure of mortality rates in paleoanthropological series. It also raises the question of whether it is possible at all to draw valid paleoanthropological conclusions from skeletal series studied as a mirrror of old-time communities.

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